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REPORT ON THE TRACTOR SLASH PILING OPERATIONS CONDUCTED ON THE COLVILLE INDIAN RESERVATION WASHINGTON 1944 AND REPORT ON LOGGING SLASH BURNING OPERATIONS CONDUCTED ON THE COLVILLE RESERVATION WASHINGTON DURING YEAR 1944

By
Harold Weaver
Forest Supervisor

Forestry & Grazing

Colville Indian Agency,
Nespelem, Washington
February 12, 1945.

Commissioner of Indian Affairs,
Chicago 54, Illinois.

Sir:

Transmitted herewith is "Report on Tractor Slash Piling Operations Conducted on the Colville Indian Reservation, Washington, 1944", prepared by Harold Weaver, Forest Supervisor. This is a companion report to "Report on Logging Slash Disposal Operations Conducted on the Colville Indian Reservation, Washington, 1944", also prepared by Mr. Weaver and transmitted to the Office by Superintendent's letter dated February 10, 1944.

It will be recalled that information with respect to tractor slash piling was requested in Office letter of June 29, 1944. In replying, on August 18, 1944, the Superintendent indicated that a detailed report would be submitted as soon as Mr. Weaver could take and process desirable photographs to illustrate the operation. The delay in preparing and forwarding this detailed report has been caused by unavoidable delays connected with the photographing of the operation and by the press of other work.

Mr. Weaver used his 4 x 5 inch Burke & James press camera to take the photos submitted with this report. This is in reality a small view camera and for most of the photos it was mounted on a heavy tripod. For the action scenes, however, it was held by hand. The 8 x 10 inch enlargements were made by Mr. Weaver on his home-made enlarger. Incidently, these will probably be the last 8 x 10 inch enlargements that Mr. Weaver can send to the office until after the War, for the paper required for such is now rationed and is very scarce.

It is believed that the photos of slash piles constructed by hand, also requested in Office letter of June 29, have already been sent in by Mr. Weaver, sometime last year.

It is suggested that Messrs. Frank B. Lenzie, Regional Forester, and Carthon R. Patrie, Forester, now at the Chicago Office, be permitted to review and comment on this report, if they so desire. Both of these men are familiar with the tractor piling operations and doubtless will have comments and suggestions to make.

Mr. Weaver desires to acknowledge the assistance given by Mrs. Gladys Harrison and Mrs. Henrietta Hall in the preparation of this report.

Respectfully,

R. C. Clark,
Acting Superintendent.

HW:hh
cc - Mr. Frank B. Lenzie,
Mr. Paul Keen

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REPORT ON THE TRACTOR SLASH PILING OPERATIONS CONDUCTED ON THE COLVILLE INDIAN RESERVATION WASHINGTON 1944

By

Harold Weaver
Forest Supervisor

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REPORT ON THE TRACTOR SLASH PILING OPERATIONS CONDUCTED ON THE COLVILLE INDIAN RESERVATION - WASHINGTON - 1944

By
Harold Weaver
Forest Supervisor

Recently the writer prepared "Report on Logging Slash Burning Operations Conducted on the Colville Indian Reservation - Washington - During the Year 1944", in which mention was made of the new method of piling slash by tractor that has been developed by the Biles-Coleman Lumber Co. This report was transmitted to the Office by Superintendent's letter of February 10, 1945.

The Office doubtless will be interested in a more detailed description of the method, the technique of piling and the results obtained. The areas on which the slash was piled by tractor, comprising approximately 860 acres, are depicted on the map of the Kerter Unit, included with the above report, entitled, "Logging Slash Conditions on Areas Cut Prior to December 1, 1944". The report also indicated that on these areas the slash thus piled originally resulted from the cutting of 6,490,000 feet, board measure, of timber.

Logging of the area was conducted during 1943 and the spring and summer of 1944. Tractor piling of the slash was started in May, 1944, and was continued intermittently until the last of September, when, as has been indicated, 6,490,000 board feet of slash had been piled. Of this amount, approximately 3,000,000 board feet consisted of green slash from timber cut by the company during the spring and early summer. The balance was dry slash from timber cut during the preceding year.

EQUIPMENT USED

The tractor used for the piling was a Caterpillar D-4, equipped with a piling blade designed by Mr. Emmett Aston, Logging Superintendent of the Biles-Coleman Co. This consisted of an old land clearing blade, with heavy, removable teeth, on top of which was welded a grille of heavy pipe to help protect the driver and the radiator of the tractor from limbs and chunks that might otherwise roll back over the top of the blade, and to facilitate the picking up or shoving of larger masses of slash. For the purpose of relieving the hydraulic lifting cylinders of constant strain two "shoes" were provided to enable the blade to ride over the surface of the ground. These proved impractical, however, and it was necessary to remove them. Though the blade was extremely rugged it was too heavy and projected so far out in front of the tractor that the front idlers and lifting cylinders were under a constant and terrific strain. Because of this overbalanced conditon the machine proved unweildly and unmanageable on the steeper, sandy slopes and its use, therefore, was of necessity confined to the gentle slopes and flats. Photo No. 1 of this report shows the tractor with the blade raised.

It is understood that an improved version of this blade is now being manufac-

tured and marketed by an equipment company of Seattle, Washington. One of the representatives of this company, who watched the Biles-Coleman tractor in operation during the summer, indicated that in his opinion the principal improvement could be made by so shortening the blade that considerably less strain would be placed on the front idlers and hydraulic lifting cylinders. This principle was doubtless incorporated in the design of the new blade. A tractor equipped with such a blade will comprise a much better balanced unit, with which it will be possible to pile on the steeper slopes.

Mr. Aston believes that the Caterpillar D-4 is the best tractor for the work, because it has ample power, at least for the piling of the slash normally encountered in the ponderosa pine region, and is at the same time fast and manoeuverable. He believes, however, that "oversized" hydraulic lifting cylinders are mandatory, because when piling the slash it is necessary to keep the blade in a lifted position almost constantly. When using a "bulldozer" blade on earth moving work, in contrast, the blade rests or rides on the ground surface at least part of the time. It is understood that the Biles-Coleman Company has recently made application through the War Production Board for the purchase of a new Caterpillar D-4 tractor, to be used for the express purpose of slash piling. It is also understood that it is to be equipped with one of the new slash piling blades now being manufactured in Seattle. Also it will doubtless be equipped with unusually large hydraulic lifting cylinders, such as Mr. Aston has indicated as desirable.

THE PILING OPERATION

Because of the extremely critical man-power situation it has been difficult for the company to hire suitable drivers for the machine used during the past summer. At least seven different drivers have thus far operated the machine on the slash piling. Some of them quit, while with others it was necessary that they be promoted as drivers of the larger logging tractors. After each driver quit or was transferred it usually was necessary for the machine to stand idle for a period of from several days to one month while attempts were made to employ a new man. Some of the men, though they were experienced bull dozer operators, disliked the slash piling because of the need of constantly operating the hydraulic mechanism to keep the blade from digging deeply into the ground. Most of them, when learning, permitted the blade to dig too deeply and were constantly stalling against large buried boulders, or the larger roots of the trees.

Despite the frequent changes of drivers and the necessity of training each new man, most of the piling work was excellent. This was probably due to the close supervision given by the company foremen and by members of the forestry personnel, notably by Mr. Edward Whalen, Forester in charge of timber sales. The work could have been improved if it had been possible to employ one or two helpers to assist by picking up the limbs and branches that were too widely scattered to make their piling by the tractor practicable and to chop and pile the saplings and poles knocked down during logging. As it was, the tractor drivers often attempted to pick up such scattered material, thereby consuming considerable time manoeuvering the ponderous machine where helpers could have accomplished the desired results

by hand piling in but a few minutes. Attempts were made to find such helpers, but such men as were employed proved unsatisfactory because of their pronounced dislike of physical effort. They much preferred to sit in the shade, while watching the tractor work.

In addition to the lighter slash, of the size normally piled by the hand pilers, the tractor also piled the heavy limbs and tops, as well as the smaller windfalls of the beetle killed trees and any other debris that happened to be in the way. The drivers were also encouraged to use the machine to push the slash against the larger windfalls and snags, where encountered, when such could be accomplished without causing damage to the advance reproduction. It was also possible with the tractor to build the piles in the larger openings, well away from the reserved trees and reproduction. With respect to size such piles averaged approximately 6 to 8 feet in height and 15 to 20 feet in diameter, though there was considerable variation in such, depending on the amount and placement of the slash and the size of the available openings. Photos numbers 2 and 3 of this report show the tractor engaged in piling the slash, while photo number 4 well illustrates a slash pile of the size above described.

It was found that when piling the older, dry slash many of the needles and smaller twigs were shattered, and lost. It is of advantage, therefore, to pile the slash as soon as possible after the logs are skidded, while the needles and branches are still green. Despite the shattering of the needles and twigs on the dry slash areas, however, an excellent job was done with the burning, as will be explained later.

Every effort was made, when piling, to avoid damage to the advance reproduction. In fact success in this connection was such that the damage already caused by the larger tractors and arches when skidding the logs was but little, if any, aggravated. Occasionally, of course, it was impossible to avoid running over a sapling or pole. It was possible to so maneuver the tractor, however, that the vast majority of these little trees entirely escaped injury. This was due largely to the skillful driving of the tractor operators, the majority of whom were most cooperative when the need and purposes of avoiding such damage were explained. Small seedlings of ponderosa pine on the areas piled were so numerous that it was impossible to avoid running over many of them. Most of them were so resilient, however, that they spring back to an erect position.

Where large trees had been felled into dense patches of poles it was sometimes considered necessary to leave the slash unpiled to avoid causing too much damage by the tractor when attempting to pile it. Sometimes it was possible, however, to maneuver the tractor between the poles to the top of the felled tree, then to shove the top and most of the large limbs into the open with one "swipe" towards the stump. Usually, when such was attempted, one of the foresters was present to direct and to assist by throwing the limbs into the path of the machine. Without the aid of an axeman it was not possible to pile most of the knocked down poles in such places, though many of such were uprooted by the blade, and piled with the other material.

It was found later, when slash burning operations were being conducted, that the tracks cut and gouged through the sod by the tractor when it turned and twisted when piling the slash were of significance in preventing the fires from running through the dense pinegrass ground cover with too much speed and heat. These places where the underlying mineral soil has been exposed will also provide excellent seed beds for ponderosa pine seedlings. There need be no fear of excessive soil erosion from such places for experience has proven that seedlings of grass and trees become established on such places very rapidly. Log skidding trails, for instance are grassed in within one year after cutting and ponderosa pine seedlings soon become established and make rapid development.

THE BURNING OPERATION

The burning operations conducted on the tractor piled areas have been described in some detail in the above mentioned general report on 1944 slash burning. As was explained therein this slash was burned on the dates of September 20 and 21, when the first light fall rain occurred, and when the second light rain occurred on the dates of September 29 and 30 and on October 2. As was also explained, an attempt was made when burning to ignite all inflammable material, including, besides the slash piles, all standing snags and windfelled snags that could be made to burn without too much effort and expenditure of time. The result was an exceptionally good cleanup of the slash and the other inflammable material, with but a minimum of damage to the advance reproduction stand. Weather and fuel moisture conditions were such that the fires from the burning slash piles, snags and windfalls crept about through the dry grass and duff, but the logging skid trails and the tracks of the slash piling tractor, above mentioned, prevented more than approximately one third of the ground surface from being so covered. Even where the fires did creep about but little damage was caused to the advance reproduction, even to the small pine seedlings. Of significance, in this connection, was the fact that the grass had previously been beaten down from the grazing of a large band of sheep. On the older slash areas the shattered needles and twigs were mostly consumed by these creeping surface fires.

All of the heavy inflammable material that could be made to burn was mostly consumed within a few days after the burning of the slash and but little patrolling and mop up work was necessary. It should be explained that the areas burned were surrounded and traversed by the original logging truck roads that had been cleared of windfalls and, where necessary, regraded by the company's motor patrol, to permit easy access and to provide fire breaks. Additional fire trails were bulldozed by tractor, where such were considered necessary.

RESULTS

As has been explained the burning resulted in an exceptionally good cleanup of the inflammable slash and debris, with but little damage to the reserve stand and the advance reproduction. The areas so treated now look "park like" in contrast to other cutover areas, even many of the older cutover areas where the slash was hand piled and burned. The seedlings, saplings and poles of ponderosa pine occupy the ground in sufficient numbers, over most of the burned areas, to comprise a fully stocked reproduction stand. At the same time the density of these little

trees is such that they will have plenty of room in which to make rapid growth. Stagnation will therefore not be a problem for many years to come. The skid trails, tracks made by the piling tractor and the spots where the slash piles burned will undoubtedly seed in to subsequent reproduction, if past experience is any criterion.

Photo number 5 well illustrates the manner in which the slash piles were consumed by the fires. It will be observed, in photo number 5, that the slash pile illustrated in photo number 4 was here burned. Photo number 6 shows the burning of a number of tractor slash piles.

COSTS

The following data relative to the costs of the tractor slash piling has been furnished by the Biles-Coleman Lumber Company.

Wages	690.5 man hours	$ 942.33
Tractor Expense	600.5 hours @ $3.50	2101.75
Total expense		$3044.08
Average cost per M board feet piled		.468
Cost of burning per M estimated		.08
Total cost of disposal per M		.548

Of the above estimated cost of $ .08 per M board feet for burning the Biles-Coleman Company probably contributed $ .03 per M, while the cost to the Indian Service probably amounted to $ .05 per M. The following actual cost figures were considered by the writer when arriving at the above estimates. The average cost per M board feet of burning the total volume of 84,870,000 board feet of slash disposed of during the fall amounts to $ .092, including a cost of $ .035 per M to the company and $ .057 per M to the Indian Service. These costs are presented in the table number 3 of the above mentioned general report on slash burning operations during 1944. On an average the crew burned 900,000 board feet of slash per day during each 27.5 working days during the season. While engaged in burning the tractor piled slash, however, the crew burned 6,490,000 board feet in 5.5 days, an average of 1,180,000 board feet per day. It is obvious therefore that the cost per M of burning the tractor piled slash was somewhat less than that for the general average for the broadcast burning. This difference can readily be accounted for by the fact that more time was of necessity required by the burners to properly ignite the slash that was scattered about over the ground, for weather and fuel moisture conditions were such, during the broadcast burning, that the fires would not readily spread through the grass to other slash. It was therefore necessary to ignite each and every top and windrow of slash.

The cost of burning of $ .08 per M for the piled slash seems rather high when compared with the average cost of similar operations conducted during pre-war years, which usually amounted to an average of approximately $ .05 per M. The difference can be accounted for by reason of higher wages now being paid and the greater care taken with the burning operation herein described. For instance, considerable time was expended in burning the snags and windfalls.

From the data presented it appears that the tractor piled approximately 85,000

board feet of slash per average working day of 8 hours. This is a very excellent record, in view of the trouble had in keeping drivers on the machine and considerable delay occassioned at various times from mechanical difficulties.

As has been indicated the writer believes that the piling can be improved and the output of work can be considerably increased by the employment of two reliable men to assist the tractor driver. These men can pick up the scattered limbs and branches and can either throw them on the pile, or in the path of the tractor, which ever is most convenient. Such assistance will make it possible for the tractor, by means of chokers, to pull large tops out of the pole and sapling patches into the openings where they can be more conveniently piled without damage. The men can also sever the roots of saplings and poles that have been knocked down during the logging, in such manner that they can either be piled by the tractor or can be thrown on the piles by hand. One of the men, on occasion, can also scout ahead to determine the best manner in which the slash can be piled with the least maneuvering of the tractor. By such assistance the writer believes that the output of piled slash can be increased to exceed an average of 100,000 board feet per day.

CONCLUSIONS AND DISCUSSION

From the facts herein presented the writer has concluded that piling by tractor is superior in every respect to that accomplished by hand pilers under even the most ideal conditions. As has been indicated, it is possible with the tractor to pile the heavy limbs, tops, windfalls and other heavy inflammable debris, in addition to the smaller limbs normally piled by the hand method. The result is a much better cleanup of the slash and other inflammable debris and a pronounced reduction of the fire hazard. By skillful maneuvering of the tractor this can be accomplished without causing excessive damage to the advance reproduction stand. Even where such stands are unusually heavy the writer believes that damage can be largely avoided by working from the skid trails already plowed through the reproduction by the logging tractors and arches.

Though an exceptionally good cleanup of slash and inflammable debris has been obtained thus far by the method, it can be improved even more by the assistance of two good men to pick up and pile the stray limbs, chop and pile knocked down saplings and poles, set chockers, etc. By such assistance the writer believes that the average daily output of work can be increased from 85,000 to more than 100,000 board feet of piled slash.

The cost of $ .468 per M Board feet for this method of piling is very reasonable, when present wage rates, costs of supplies, etc., are considered. Operators at the present time offer from $ .65 to $ .75 per M for hand piling, with very few men taking advantage of such opportunities. Even if they offered $1.50 per M for piling it is doubtful if very much of the slash would be piled. The men to do such work simply are not in the region at the present time. After the war, of course, woods workers will again be plentiful.

Even when common labor again becomes plentiful in the woods the writer believes that tractor slash piling will hold it's own, for with added experience and increased

efficiency the average cost per M board feet of conducting such work will be decreased considerably.

Though the slash piles are quite large it is possible with the tractor to build them in the larger openings, well away from the reserved trees and the advance reproduction. Damage from scorching, therefore, does not exceed that ordinarily experienced when burning hand piles. Because of the large size of the piles, also, it is possible to conduct the burning under more adverse weather conditions.

On the Colville Reservation the topography is such that the tractors can probably pile slash over from 60 to 85 per cent of the ground surface. Even with the improved piling blades it will probably not be possible for the tractor to operate efficiently on the steeper slopes and on areas where large boulders or solid rock outcrops are too numerous. Here, on these areas, comprising from 15 to 40 percent of the ground surface, other methods of disposal can be practiced. This slash can either be left unpiled, lopped and scattered, hand piled and burned, or broadcast burned, which ever appears most desirable and feasible. From experience the writer believes that by taking advantage of favorable conditions most of this slash can be broadcast burned on the Colville Reservation.

In this report the discussion has been confined to the operations conducted on the Harter and Moses Mountain Units, because the Biles-Coleman Lumber Company pioneered in this method of slash piling and because the greatest volume of slash was there piled. It should be noted that the Lincoln Lumber Company tractor piled approximately 600,000 board feet of slash on the Twin Lakes Unit during 1944, with results similar to those herein described. Cost data with respect to such work, however, has thus far not been submitted by this company. It is hoped that the Lincoln Lumber Company will take the steps necessary for the more intensive use of this method on the Twin Lakes Unit. Such operations should prove very interesting, because of the heavier stands of ponderosa pine and Douglas fir reproduction, of sapling and pole size, that characterize the Twin Lakes Unit. Photo number 7, with this report, shows the tractor used for slash piling by the Lincoln Company during the year 1944.

It is interesting to note that in conversation with the writer on recent date Mr. Lester Parrish, one of the partners of the Lincoln Lumber Company, expressed the belief that the Caterpillar D-6 tractor is more desirable for slash piling than the D-4, under the conditions existing on the Twin Lakes Unit, where the timber is comparatively larger and the slopes steeper. He has made application through the War Production Board for the purchase of a Caterpillar D-8 for the purpose of skidding logs. When such a tractor is obtained he intends to use for the slash piling one of the D-6 tractors now engaged in skidding logs.

Harold Weaver,
Forest Supervisor.

HW:gvh
Colville Indian Agency,
Nespelem, Washington.
February 12, 1945.

PHOTO NO. 1

The Biles-Coleman slash piling tractor with blade raised. Over the top of the tractor there can be seen a slash pile that had just been completed. To the right of the tractor can be seen some of the scattered limbs that could have been picked up by assistant hand pilers. As can be observed in the photo the slash piling blade was super-imposed over the regular bulldozing attachment, from which the blade had been removed. By this arrangement the heavy piling blade projected too far out in front, thus over-balancing the tractor and causing severe strain to the front idlers and the hydraulic lifting cylinders, one of which can be seen below the driver in the photo. This photo was taken in late August, 1944, in NW/4 Section 16, Township 32 North, Range 29 East, in the Kerter Unit on the summit of the Omak Lake Ridge.

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PHOTO NO. 2

The Biles-Coleman slash piling tractor in action in June, 1944, in SW/4 Section 17, Township 32 North, Range 29 East, in the Kartar Unit on the Omak Lake Ridge. Further details concerning the attachment of the slash piling blade, explained in photo number 1, can here be observed. One of the hydraulic lifting cylinders can also be seen along the side of the tractor, above the tracks.

PHOTO NO. 3

Another view of the slash piling tractor in action in SW/4 Section 17. This photo was also taken in June, 1944, and will illustrates the piling conducted on the Omak Lake Ridge. Though the ground between the piles appears grassy, close inspection will reveal that many little ponderosa pine seedlings are also growing. An excellent clean-up was obtained when the slash was burned. Also enough of the saplings have survived to comprise an excellent, fully stocked reproduction stand.

PHOTO NO. 4

This slash pile in the SE/4 of Section 18, Township 32 North, Range 29 East, is typical of the work accomplished by the Biles-Coleman slash piling tractor. This slash was piled in May, 1944, and the photo was taken shortly thereafter. Notice the new terminal and lateral growth shoots on the ponderosa pine poles in the background.

PHOTO NO. 5

This photo, taken in late October, 1944, shows where the slash pile illustrated in photo number 4 was burned earlier in the month. As can be observed in this photo the slash pile was originally built on a logging skid trail coming down off the hill to the right. The saplings in the right foreground were knocked down and mangled by the skidding tractors at that time. At the extreme right can also be observed several saplings that have escaped injury from the logging, slash piling and burning, despite close proximity to the pile. It will also be observed that some of the snags that appeared in photo number 4 have been burned down. On the ground between the snags still standing in the right foreground it can be seen where one of these burned up almost entirely. Under the poles at the left the fire crept about on the ground through the matted litter of pine needles. Elsewhere, however, the fire failed to run through the grass cover.

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PHOTO NO. 6

Tractor slash piles burning in the NE/4 of Section 19, Township 32 North, Range 29 East, on the south slope of the Omak Lake Ridge on the date of September 30, 1944. In the background, to the right it can be observed that fires are burning at the bases of the two pine snags.

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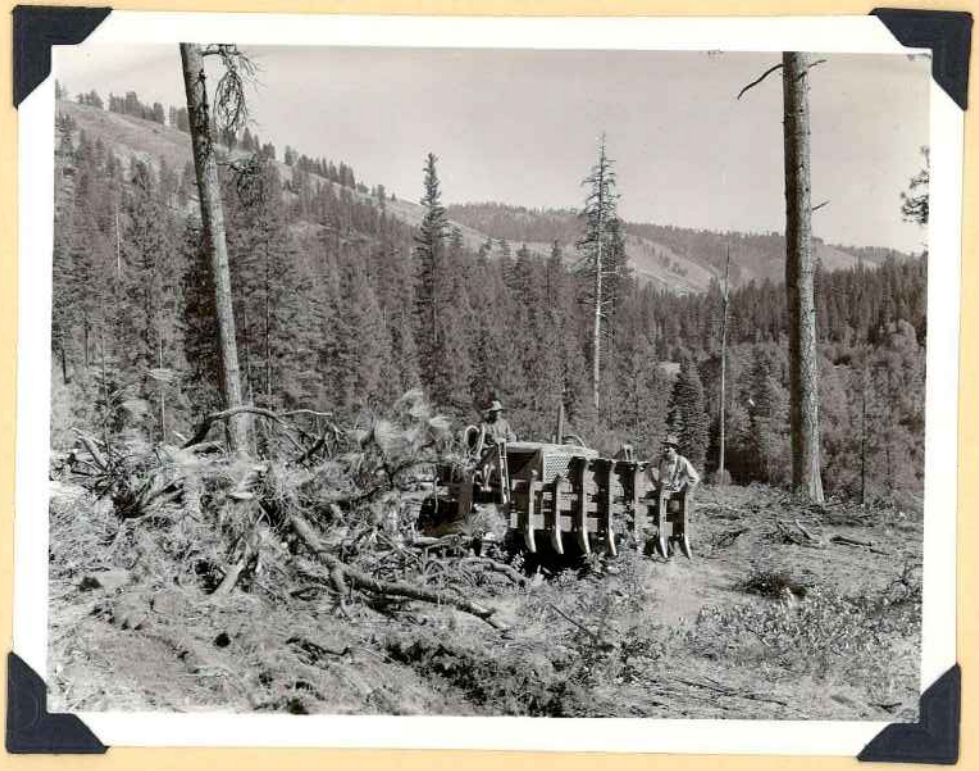
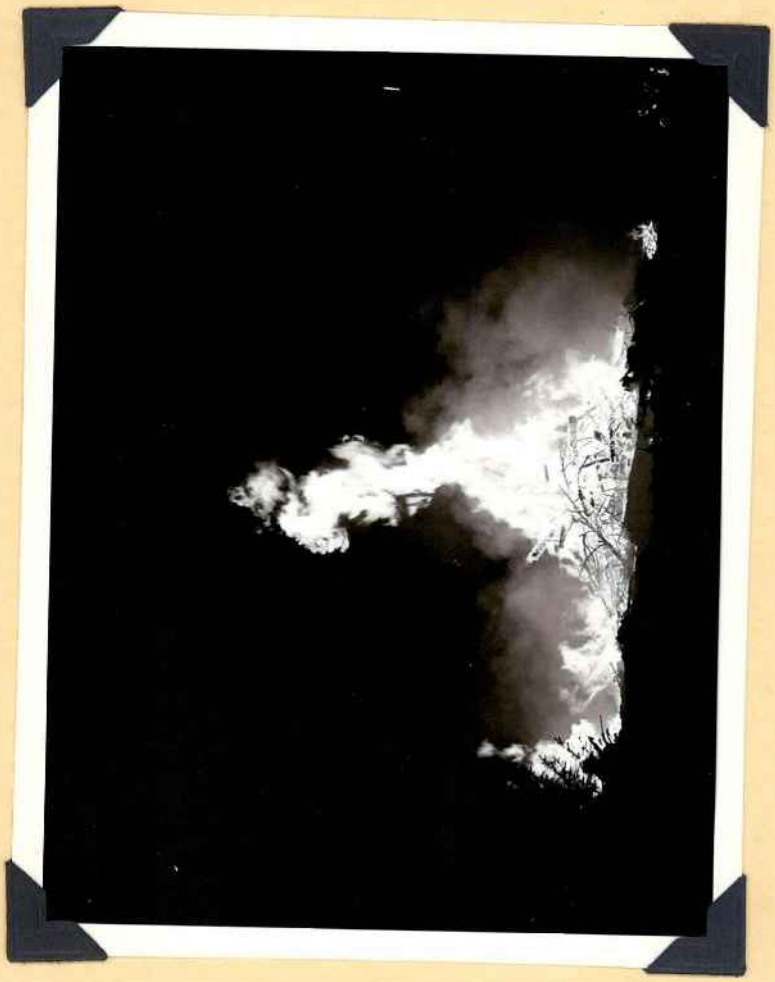
PHOTO NO. 7

The slash piling tractor of the Lincoln Lumber Company in the SE/4 of Section 12, Township 34 North, Range 35 East, near Elbow Lake on the Twin Lakes Unit. This photo was taken in August, 1944.





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NO. 621½

MADE IN U. S. A.

Forestry & Grazing

Colville Indian Agency,
Nespelem, Washington,
February 10, 1945.

Commissioner of Indian Affairs,
Chicago 54, Illinois.

Sir:

Transmitted herewith is "Report on Logging Slash Burning Operations Conducted on the Colville Indian Reservation, Washington, During the Year 1944", by Harold Weaver, Forest Supervisor. This report indicates that during the year the slash from the selective cutting of a volume of 56,640,000 board feet of timber, on the various timber sale units of the Colville Reservation, was disposed of on 9,680 acres. This was accomplished largely by broadcast burning and, on a portion of the area, by tractor piling of the slash, then burning. The report also indicates that all of the disposal operations were closely supervised by the forestry personnel of the Colville Reservation and that these men actually accomplished much of the work.

Excellent results have been obtained. The critical fire hazard has been reduced materially through the disposal of the slash and this has been accomplished in such manner that but little damage has been caused to the reserved trees and advance reproduction. The lumber companies have made every effort to cooperate and to participate in the work and have actually made substantial contributions. It should be realized, however, that because of the present extremely critical manpower situation in this part of the Pacific Northwest, the companies can contribute but part of the men needed. Also, they can contribute but little towards the supervision of such operations, for under present conditions their foremen are fully occupied by the harassing problems connected with the cutting and transportation of timber. If slash disposal operations are to be conducted, therefore, it is up to the Indian Service to initiate the necessary action and to furnish supervision and all of the man power available. Because of these conditions and because of the excellent results thus far obtained, it is believed that continued strenous efforts in this connection by the Indian Service are fully justified.

The report also indicates that the slash problem is still critical for the slash from the cutting of a volume of approximately 67,000,000 board feet of timber still lies strewn about over 11,000 acres and additional slash is continuing to accumulate from the cutting of approximately 4,000,000 board feet of timber each month. Mr. Weaver indicates, in this connection, that every effort will be made to encourage the lumber companies to tractor pile as large a portion as possible of this huge volume of slash during the coming spring and summer months. He believes that the best method of disposal is by tractor piling and burning.

Tables number 4 and 5 of the report, it will be noted, are incomplete with respect to the costs of disposal incurred by the operators on the Twin Lakes Unit and the Manila Creek Indian Logging Unit The Lincoln Lumber Company, operating

on the Twin Lakes Unit, has indicated that every effort is being made to arrive at the costs actually chargeable to slash disposal and that the records of such will be forwarded to this office in the near future. With respect to the Manila Creek Unit, however, it is somewhat doubtful that we can ever obtain authentic data pertaining to costs of disposal incurred by the various Indian operators. Any authentic data that is obtained, however, will be forwarded for the information of the Office and for inclusion with the report, if it is so desired.

It was originally planned to route this report through the Regional Forester's Office in Spokane, Washington. It is understood, however, that both Regional Forester Frank B. Lenzie and Forester Carthon R. Patrie are now at the Chicago Office. It is suggested that these men be permitted to review the report, if they so desire, since they are familiar with the operations described and may desire to make suggestions or comments.

Mr. Weaver desire to acknowledge the assistance rendered in the preparation of this report by Mr. Francis S. Van Sickle, who prepared the maps, and by Mrs. Henrietta Hall, who performed the typing.

Mr. Weaver is preparing another illustrated report on the tractor piling, to be submitted in the near future. The photographs, it should be mentioned, were taken by Mr. Weaver with his 4 x 5 inch Burke & James camera, then enlarged to approximately 8 x 10 inches by means of his home-made enlarger. The photographic materials were furnished by him.

Any comments that the Office may care to make with respect to this report will be appreciated.

Respectfully,

R. C. Clark,
Acting Superintendent.

HW:hh
Encls.
cc- Mr. Frank B. Lenzie,
Mr. Paul Keen.

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REPORT ON LOGGING SLASH BURNING OPERATIONS CONDUCTED ON THE COLVILLE INDIAN RESERVATION WASHINGTON DURING THE YEAR 1944

By

Harold Weaver
Forest Supervisor

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REPORT ON LOGGING SLASH BURNING OPERATIONS CONDUCTED ON THE COLVILLE INDIAN RESERVATION - WASHINGTON DURING THE YEAR 1944

By
Harold Weaver
Forest Supervisor

A detailed report on the logging slash situation on the Colville Reservation to the date of December 1, 1943, has been made to the Office by the writer in "Report On Broadcast Slash Burning In Selectively Cut Ponderosa Pine Stands - Colville Indian Reservation - Washington, Fall of 1943". Therein were described the broadcast burning operations that were undertaken in an effort to at least partially dispose of the highly inflammable logging slash that has accumulated in considerable quantities in an unpiled condition on the various timber sale units. This slash has accumulated because of the extreme man-power shortage and the inability of the operating lumber companies to find men who will do the piling at any wage rate. As the report indicates the burned areas resulting from these operations will serve as firebreaks that will afford better opportunities for the control of any fires that may start in the remaining interspersed areas of extremely hazardous slashings. Maps and photographs were included to illustrate the various conditions discussed and operations described. The Office commented on the report and endorsed the continuance of broadcast slash burning operations on an experimental basis in a letter directed to the Superintendent on the date of June 20, 1944.

RESULTS OF THE SLASH BURNING OPERATIONS CONDUCTED DURING THE FALL OF 1943

Broadcast slash burning has commonly been considered the very antithesis of good forestry practice in the ponderosa pine stands that have been cut over by the various selective systems, because of observations made of disposal operations conducted by this method on certain lands in the past and because of the belief, based on such observations, that under this method it is impossible to so control the fires that serious damage will not be caused to the reserve stand of merchantable trees and the advance reproduction. However, the fall of 1943 operations that were undertaken in desperation, so to speak, in an effort to decrease the very serious fire hazard, have proven that under proper conditions the burning can be so conducted that such serious damage is avoided. In this respect the Twenty-three Mile slash burn, described in the report on the 1943 operations, has proven most enlightening. On this area of 340 acres, over one year after the burn, many thousands of green ponderosa pine seedlings are just beginning to over-top the dense pinegrass stand, despite the fact that an estimated 60 to 70 percent of the ground surface was lightly burned by the fires that crept about through the dry grass and needle mat. The severely burned patches, comprising from 15 to 20 percent of the ground surface, where the tops and limbs, of the felled trees, and the snags and windfalls burned up, were of course mostly bare during the summer of 1944, with only occasional weeds or spears of pinegrass appearing. Observers are astonished, however, to find many green seedlings growing within several feet of such areas. This can probably

be accounted for by the fact that while the hot fires are burning the resultant updraft of heated air is always accompanied by an inrush of cool air near the ground where the little seedlings are growing. Though many of the less fortunately situated of these little trees were killed by the hot fires, and many of the weaker individuals were also eliminated by the subsequent creeping grass and duff fires, the surviving seedlings are quite uniformly distributed and are sufficiently numerous, over the major portion of the area, to comprise a fully stocked reproduction stand. These seedlings antedate the slash burn, since most of them are at least seven or eight years of age.

The results above discussed refute the belief that fires can not be permitted to run or creep about over the forest floor, under any conditions, without killing practically all of the small ponderosa pine seedlings. Of considerable influence in this connection, however, may have been the fact that the area was grazed moderately by sheep shortly before the burning took place. It is the writer's opinion that these animals beat down the grass and cut up the surface in such manner that the fire was prevented from running about over the forest floor with the speed and heat that it might otherwise have attained if burning through an unbroken and undisturbed grass cover. Such experience indicates that in the future, on similar areas, it may be helpful to graze sheep shortly before broadcast burning is attempted.

Very similar results to those above described were obtained on the Kartar burn, though, as the above mentioned report indicates, the fire burned with more heat and caused more damage than that resulting from the Twenty-three Mile burn. Of the several conditions that probably account for this difference it is probable that most significant are the weather, the steep south slopes of the area and the heavy grass cover, that had not previously been subjected to grazing by sheep.

SLASH BURNING OPERATIONS CONDUCTED DURING THE SPRING OF 1944

The results of the broadcast burning conducted during the fall of 1943 were so favorable, as has been indicated, that it was decided to continue such burning during the spring of 1944. Conditions were ideal for such operations. Brief warm spells ("Chinooks") during the months of February and early March melted the light winter snow from the grassy lowlands and lower south slopes in the pine timber. Thereafter the weather turned cold and dry and most of the month of March was characterized by bright, sunny days and clear, cold nights. The snow continued to melt gradually during the mid-day hours, but patches persisted in the ravines and on the north slopes until the middle of April. Burning was started on the Kartar Unit on March 17, and on the Manila Creek Unit shortly thereafter. These operations were continued on the Kartar Unit with all of the speed that the weather and the extremely limited man-power would permit until a heavy rain storm on April 7 temporarily stopped them. They were again resumed on the date of April 28 and 29, when the last of such operations were conducted on this unit. In the meantime burning continued intermittently on the Manila Creek Unit and ceased on the date of May 3. The burning on both units was supervised and a considerable

portion of it actually accomplished by members of the regular forestry personnel of the Indian Service.

With respect to cooperation from the lumber companies on this work, the Miles-Coleman Lumber Company furnished a crew of from 6 to 12 men for a total period of 6 days during the burning operations on the Kartar Unit. The Lincoln Lumber Company assisted with a "pickup" crew of 5 men for one day during the burning of Compartment No. 1 on the Manila Creek Unit. It should be explained that the timber on this unit had been cut by an Indian operator, Mr. George Whitelaw, now deceased. However, the cash bond money required as a guaranty of performance under the terms of the timber cutting contract had originally been advanced on his behalf by the Lincoln Lumber Company. The company is anxious, therefore, that the slash be cleaned up so that the cash bond can be released. On Compartment No. 4 of the Manila Creek Unit, the timber cutting contract was cancelled on the date of April 11, 1944, because the Indian operator, Mr. Alvin Leighton, had made no effort, despite repeated urging, either to dispose of the slash or to assist in its disposal. The bond money guaranteeing performance on this contract was then used for the employment of a temporary laborer, who burned slash on the compartment during the greater part of the month of April and the first three days of May. It should be mentioned that there still remains a considerable amount of work that must be accomplished before these compartments can be considered completed with respect to slash disposal. The bond money is therefore still being held.

When discussing the amount of slash disposal work accomplished during the spring, and on the following pages where the fall work is discussed, it will be noted that the amounts of slash disposed of are referred to in terms of the "number of board feet burned". This term has become established through common usage and is a means of roughly measuring the amount of slash on the ground, or the amount disposed of, in terms of the merchantable volume of the timber, measured in board feet, that was actually cut and removed from the area in question. The slash resulting from the cutting of the timber is of such nature that the measure of its actual volume could never be expressed in terms of "board feet". When it is indicated that a certain "board feet volume of slash" was burned, however, the forester or logger knows that by such is meant that the slash from the given volume of cut timber has been disposed of.

With reference again to the spring burning, the total volume of slash disposed of by these operations amounted to approximately 13,780,000 board feet, on an area of 2,660 acres. Of this amount only 650,000 board feet had originally been hand piled on 140 acres. The bulk of the slash was disposed of by broadcast burning. The results of this work lead to the conclusion that spring broadcast burning should in the future be attempted only on the driest south slopes, under conditions such as prevailed during the spring of 1944 on the Colville Reservation. In most instances, it was noted, a rather poor clean-up of the slash was obtained on slopes of other aspect and on the flats, because moisture conditions were such that most of the twigs and limbs failed to burn. Unless the slash is compactly piled, under such weather and moisture conditions, the fires usually go out after burning only the needles. Good results were obtained on the extensive south slopes,

SLASH BURNING OPERATIONS CONDUCTED DURING THE
FALL OF 1944.

During the fall of 1944 a volume of approximately 43,070,000 board feet of slash was disposed of by burning on 7,120 acres. Of this amount a volume of 35,260,000 board feet was broadcast burned on 5,990 acres, 7,090,000 board feet consisted of slash that had previously been tractor piled on 1010 acres, during the summer of 1944, and 720,000 board feet consisted of slash that had previously been hand piled, several years ago, on 120 acres.

The summer of 1944 was exceptionally dry and hazardous and the Colville Reservation was fortunate indeed to escape damaging timber fires. Of particular concern to the forestry personnel were the extensive areas of undisposed of slashings on the Moses Mountain and Nartar Units, in the western part of the reservation, and on the Twin Lakes Unit, in the eastern part. As a precautionary measure, to provide access to these areas and to clear fire breaks that would facilitate control in the event that fires did start, the fire guard crew of the Colville Reservation cleared the windfalls from many of the old abandoned logging roads that traversed the slashings of the Nartar and Moses Mountain Units on the Omak Lake Ridge area. The most strategically located of these were then regraded by means of the motor petrol of the Biles-Coleman Lumber Company. In addition the company furnished a tractor with bulldozer for the construction of additional fire lines where needed. These roads and fire lines were later used to advantage during the slash burning operations.

The first light rain fell intermittently on the dates of September 20 and 21. Full advantage was taken of this wet cloudy weather by the burning of 3,000,000 board feet of tractor piled slash on the Omak Lake Ridge. In addition to firing the slash piles the men of the crew were also instructed to fire every snag and windfall that could be ignited without the expenditure of too much time and effort. Very favorable results were obtained, for the area was left exceptionally clean with respect to inflammable debris, while, at the same time, but little damage was caused to the reserved trees and advance reproduction. It should be explained that though the piles were quite large, it was possible, by means of the powerful tractor, to shove them into the larger openings where but the minimum damage to reserved trees and reproduction from scorching resulted from the burning.

The remainder of the tractor piled slash on the Nartar and Moses Mountain Units, comprising approximately 3,500,000 board feet, was burned during the second light rain storm that occurred on September 29 and 30, and on October 2, when the weather again cleared. Again excellent results were obtained. Thereafter broadcast burning operations were conducted in adjacent slashings on the Omak Lake Ridge area until heavy fall rains on October 31 put an end to such burning for the remainder of the year. In this manner an additional 17,180,000 board feet of slash was disposed of on 2,860 acres of the Nartar and Moses Mountain Units.

While the burning of the tractor piled and unpiled slash was conducted on the extensive summit area of the ridge and on the gentle north slopes, no extra precautions were necessary, except that it was usually mandatory that every slash pile or every top and windrow of limbs be individually fired in order to obtain a clean burn. The fire evidenced little tendency to run away from the piles or

the tops and limbs and, from observation, the writer estimates that on the average hardly more than one-third of the ground surface was actually burned. The frosty nights and the fact that the summit areas and north slopes had previously been grazed by sheep probably account for the inability of the fires to spread far from the burning slash, windfalls, etc. It is also of interest to note that on the areas tractor piled the gougings and trails left by the tractor served as very effective fire breaks that retarded the rapid spread of the fires.

Later in the month of October, when all of the slash at the higher elevations on the ridge had been burned and the burning progressed to the steeper south slopes, conditions were encountered that were somewhat reminiscent of those associated with the nearby Harter burn of the previous fall. Much greater care had to be taken with the burning.

During the burning operations on the Cmak Lake Ridge the crew consisted of from six to eight men, including usually from 2 to 5 members of the regular forestry personnel and from 3 to 6 men who had formerly worked on the fire guard crew. The latter, during the burning, were placed on the payroll of the Miles-Coleman Lumber Company. The company also attempted, on a number of occasions, to send additional assistance from the logging and mill crews. These men seldom stayed as long as one day. Their excuses for quitting were that the work was too hard, they were afraid of the torches, etc. Some insight into the difficulties experienced by the companies in employing and keeping labor may be gained from these experiences. Most of the good men, who formerly worked in the woods, are now in the armed services or in other higher paying defense industries.

Propane torches were used for the burning. These torches are simple to operate, because of the manipulation of but one valve the flame can be turned down low, or a terrifically hot blast of flame can be delivered. They are heavy, however, weighing approximately 35 to 40 pounds when full of gas, and are difficult to refill. For this purpose the company furnished either Flamo or Shellane in 100 pound pressure tanks. The transfer of the gas from these tanks to the torch containers was a rather delicate operation, requiring the heating of the gas in the tank to a higher temperature than that in the container, its transfer through a leak proof pipe or rubber hose connection, and the measurement of the gas transferred by means of weighing on a scale. If too heavily charged the safety valves blew out and the gas was wasted. The torches were usually filled in the mornings, before burning started, or, if necessary, at noon.

The slash burning on Cmak Lake Ridge was at one time postponed for a period of two days while the crew was dispatched for the burning of the old slash remaining on the Tunk Creek Unit, in the extreme northwestern corner of the reservation. This operation involved the burning of approximately 720,000 board feet of slash that had been hand piled and the broadcast burning of approximately 480,000 board feet.

Also during the month of October an estimated 1,800,000 board feet of slash was broadcast burned on Compartment No. 5 of the Manila Creek Unit, by Mr. William Auberton, the Indian Contractor. This was done under the supervision of the

forester in charge of the sale. It was necessary because of the steep slopes that fire lines first be bulldozed about the areas to be burned. During the burning care had to be taken to burn from the tops of the ridges down the slopes, to prevent the fires from making any runs of sufficient duration to permit the building up of a destructive volume of heat. From general observations an excellent job was done.

The burning conducted on the Twin Lakes Unit was probably the most difficult of all, because of the steep slopes there encountered, the dense reproduction and the heavy stands of brush that covered extensive areas. For this burning operation the Lincoln Lumber Company assigned its entire logging crew. Part of the crew promptly took a vacation, indicating that they would "be back after the burning", but from 8 to 12 to 12 men were usually available to help. The work was closely supervised at all times by the two foresters assigned to the timber sale.

The burning on this Unit was started on the date of October 2 and was completed on October 20, by which time approximately 15,800,00 board feet of slash was broadcast burned on 2,750 acres and 600,000 board feet of tractor piled slash was burned on 150 acres. Knuck gasoline torches were used for the firing. Constant precautions had to be taken to prevent the fires from running sufficiently to build up a dangerous degree of momentum and heat. This was done by first burning the tops of the ridges along the previously established fire lines, then by burning gradually down the faces of the slopes along the contours. When conducting such operations, for example, torch man number one would be started first across a slope along the contour, burning a strip from 20 to 40 or 50 feet wide, depending on the degree of slope, the amount and arrangement of the slash and the nature of the reproduction stand. After this strip cooled sufficiently torch man number two was started, burning a strip below of similar width. Then torch men number 3, 4, etc., were in turn started across the slope. A tractor of the lumber company's, towing the Indian Service Hester disc plow from the Inchelium Sub-Agency, was used for the plowing of the fire lines and while the burning was in progress was held on "standby duty" for the construction of fire lines should the fire escape control.

The greatest portion of the ground surface was covered by fire, probably because of the steep slopes and the unbroken grass cover on the higher portions of the burned plots where sheep grazing had not occurred for the previous two years. The work was so well supervised and conducted, however, that only occasional small groups of saplings or poles were severely damaged or killed. Most of the company men on the crew were in sympathy with the objectives desired and were interested in the work. Though topographic, ground cover and slash conditions were more difficult than those encountered on the Coeur Lake Ridge, the results obtained were very similar. The major portion of the slash was disposed of, together with the snags, windfalls and other inflammable debris, while at the same time the reproduction stand survived with only slight to moderate damage. The effects of the fire on the various shrub species will be watched with interest. It is hoped that they will either be killed or so discouraged that the grasses may gain the advantage.

RESULTS AND DISCUSSION

As has been indicated in the preceding pages the broadcast burning on the Colville Reservation has been conducted in accordance with a definite plan that has been motivated by the desire to at least partially reduce the dangerous accumulation of slash, that has been continuing to build up as a result of the logging operations, and by the belief, based on past experience, that on many areas controlled fire can properly be applied more intensively and on a much broader scale than on that commonly considered compatible with good forestry practice in the ponderosa-pine region. It should not be concluded that the methods herein described are applicable under all conditions to all portions of the ponderosa-pine region. For the ponderosa-pine stands of the Colville Reservation, however, under the conditions that have obtained, the burning methods employed have produced results that are excellent.

As has also been indicated a volume of 56,640,000 board feet of slash has been disposed of by burning on 9,680 acres during the year 1944. Of this amount 13,570,000 board feet were burned on 2,560 acres during the spring season and 43,070,000 board feet were burned on 7,120 acres during the fall. Of the amount burned during the fall, a volume of 35,280,000 board feet was disposed of by broadcast burning on 5,990 acres, 7,090,000 board feet consisted of slash that had previously been tractor piled on 1,010 acres, and 720,000 board feet consisted of slash that had previously been hand piled.

The fall burning cleaned up the slash in a much more satisfactory manner than did the spring burning. In fact, from the experience had under the conditions that happened to prevail on the Colville Reservation, spring burning in the future should be attempted only on the driest south slopes.

As has been indicated, the results obtained from the burning conducted during the fall have been excellent. The slash has been disposed of in a most satisfactory manner and, in addition, the burning has been so conducted that the advance reproduction stands have survived with but light to moderate damage. Of particular interest, in this connection is the Omak Lake Ridge area, where topographic, timber and ground cover conditions are closely similar to those encountered on the area slash burned on Twenty-three Mile Creek during the previous fall of 1943. It is apparent on Omak Lake Ridge that countless thousands of seedlings, saplings and poles of ponderosa pine have survived with but little damage and that these trees are distributed in sufficient uniformity to comprise an excellent, fully stocked reproduction stand over most of the area.

Through trial and error much has been learned with respect to the proper methods of conducting such burning operations under the conditions that have obtained on the Colville Reservation. It has been learned, for instance, that where small seedlings are growning in the midst of heavy pine grass, excessive damage from broadcast burning can be prevented by first grazing the area rather heavily by sheep. Under certain conditions the burning of the steeper south slopes should be postponed until in the spring. Certain species of shrub, particularly the bitterbrush (Purshia tridentata) and the snowbrush (Ceanothus velutinus), are apt to burn with such intensity that excessive damage may be caused to nearby trees.

It may sometimes be necessary, therefore, to avoid broadcast burning some of the areas where these shrubs are numerous and where the reproduction of ponderosa pine is interspersed. Properly located fire lines should always be constructed before the burning is attempted.

The most critical factor encountered in connection with broadcast burning is the weather. Such must be almost perfect for such purposes if the slash is to be made to burn by the broadcast method. If the weather is too dry the fire will certainly burn with great intensity, but it will cause too much damage. On the other hand, if the weather is slightly too wet a poor burn will result with an unsatisfactory clean-up of the slash. The fall of 1944 was exceptionally favorable for broadcast burning, but another such fall may not occur for several years. During the fall of 1943, for instance, only several days occurred when the weather was favorable. Also, during the fall of 1941 it was so wet that it was impossible to burn any but the compactly piled slash.

Because of the uncertain weather element connected with broadcast burning the writer favors disposal by tractor piling and burning where ever such operations can be conducted economically. He believes that this method is superior to the old hand piling method because by use of the tractor it is possible to pile the heavy inflammable debris, such as the tops, heavy limbs and windfalls, in addition to the small limbs ordinarily piled by hand. Experience has proven, also, that the tractor can be so manoeuvered that even moderate damage to the saplings and poles of the advance reproduction stand can be largely avoided. In fact, by skillful manoeuvering, it is possible to avoid further aggravation of the damage already caused by the felling and skidding during the logging operations. Under the conditions prevailing on the Colville Reservation it is estimated that the tractor can cover from 80 to 85 percent of the ground surface. On the steeper, rockier areas, where the tractor can not operate, the slash can be left unpiled, can be piled by hand, or can be broadcast burned. Disposal on such areas can be accomplished by the method that appears most appropriate under the circumstances.

On the following pages there are presented tables summarizing the data with respect to the amounts of slash disposed of by various methods on the various timber sale units during the fall season of 1943 and the spring and fall seasons of 1944, and the costs incurred on such work by the Indian Service and the cooperating lumber companies during the year 1944. Also presented on the pages following are maps depicting the various areas burned and photographs illustrating the burning activities.

It will be noted that Table No. 2 indicates that at the end of the year 1944 approximately 67,000,000 board feet of slash still remained unpiled and undisposed of on 11,000 acres. This slash continues to accumulate at the rate of approximately 4,000,000 board feet per month. It thus appears that by October an additional volume of approximately 36,000,000 board feet of slash will have accumulated and that the total accumulation will amount to 103,000,000 board feet. As a result the fire danger will be extreme during the summer of 1945.

It is hoped that the lumber companies will find it possible to tractor pile a substantial portion of this slash during the coming spring and summer seasons. The Files-Coleman is attempting to purchase an additional caterpillar D-4 tractor equipped with a slash piling rake for this purpose. It is hoped that the Lincoln Lumber Company will also make more strenuous efforts in this connection.

Harold Weaver,
Forest Supervisor.

HW:hh

Colville Indian Agency,
Nespelem, Washington,
February 10, 1945.

TABLE NO. 1

STATISTICAL SUMMARY OF COLVILLE RESERVATION
SLASH DISPOSAL OPERATIONS FOR THE FALL OF 1943
AND THE SPRING AND FALL OF 1944

Name of Unit	Method of Disposal	Amount of Slash Disposed of by Seasons						Totals-Fall 1943 & 1944	
		Fall of 1943		Spring of 1944		Fall of 1944			
		No.of Acres	Vol.M. Ft.B.M.	No.of Acres	Vol.M. Ft.B.M.	No.of Acres	Vol.M. Ft.B.M.	No.of Acres	Vol.M. Ft.B.M.
Karter	1.Hand pile and burn	430	3180	80	400	-	-	510	3580
	2.Broadcast Burn	690	5100	1490	6500	1500	10210	3670	22810
	3.Tractor pile & burn	-	-	-	-	810	6120	810	6120
Moses Mt.	1.Hand pile and burn	70	420	-	-	-	-	70	420
	2.Broadcast burn	-	-	70	520	1060	6970	1130	7490
	3.Tractor Pile & burn	-	-	-	-	50	370	50	370
Twin Lakes	1.Hand pile and burn	160	600	-	-	-	-	160	600
	2.Broadcast burn	-	-	-	-	2750	15800	2750	15800
	3.Tractor Pile & Burn	-	-	-	-	150	600	160	600
Tunk Creek	1.Hand pile and burn	-	-	-	-	120	720	120	720
	2.Broadcast Burn	-	-	-	-	80	480	80	480
Nanile Creek	1.Hand pile and burn	480	2000	-	-	-	-	480	2000
	2.Broadcast Burn	-	-	970	3900	800	1800	1470	5700
West Fork	2.Broadcast burn	340	3000	-	-	-	-	340	3000
Indian Creek	1.Hand pile and burn	20	200	-	-	-	-	20	200
Brush Creek	1.Hand pile and burn	-	-	60	250	-	-	60	250
Totals	1.Hand pile and burn	1130	6400	140	650	120	720	1420	7770
	2.Broadcast Burn	1030	8100	2430	12920	5990	35260	9440	56280
	3.Tractor pile & burn	-	-	-	-	1010	7090	1010	7090
GRAND TOTALS		8190	14500	2580	13570	7120	43070	11870	71140

TABLE NO. 2

SUMMARY OF SLASH UNDER AND UNTREATED
ON COLVILLE INDIAN RESERVATION AS
OF DECEMBER 31, 1944

Name of Unit	No. of Acres	Vol. M. ft. B. M.
Kartar	2,230	15,000
Roses Mountain	3,700	25,000
Twin Lakes	2,070	11,500
Tunk Creek	--	--
Manila Creek	250	3,750
West Fork	1,500	9,100
Indian Creek	80	750
Brush Creek	230	1,100
Misc. Small Sales	135	540
TOTALS	11,095	68,740

TABLE NO. 3

STATEMENT SHOWING THE COSTS OF SLASH DISPOSAL ON THE MOSES MOUNTAIN, KARTAR AND TUNK CREEK TIMBER UNITS OF THE COLVILLE INDIAN RESERVATION DURING THE YEAR 1944

Item of Expense	Costs Incurred by the Miles-Coleman Lumber Company.		Costs Incurred by the Indian Service.		Total Costs
	Man Hrs. Etc.	Cost	Man Days Etc.	Cost	
1. Spring burning of 9,420,000 Ft. B. M.					
Salaries and Wages,	410	297.19	35	232.24	529.43
Transportation,	143 Mi. @ .07	9.94	-	40.57	50.51
Materials	-	30.00	-	-	30.00
Total	-	337.13	-	272.81	609.94
Avg. Cost per M. ft. burned	-	.036	-	.029	.065
2. Fall burning of 24,870,000 ft. B.M.					
Salaries and wages,	794	765.90	144	1137.41	1903.31
Transportation,	364 Mi. @ .07	25.48	-	273.49	298.97
Materials	-	77.10	-	11.00	88.10
Total	-	868.48	-	1421.80	2290.28
Avg. Cost per M. ft. burned	-	.035	-	.057	.092
3. Total cost - Burning 34,290,000 ft. B. M. of slash.	-	1205.61	-	1694.61	2900.22
4. Cost of tractor piling 6,490,000 ft. B. M.					
Salaries and wages,	690.5	942.33	-	-	942.33
Tractor expense,	600.5 Hrs. @ 3.50	2101.75	-	-	2101.75
Total	-	3044.08	-	-	3044.08
Avg. per M. ft. piled,	-	.469	-	-	.469
Cost per M. of burning	-	.035	-	.057	.092
Total cost per M.	-	.503	-	.057	.560
5. Total cost of disposal operations	-	4249.69	-	1694.61	5944.30
Avg. cost per M.	-	.124	-	.050	.174

TABLE NO. 4

STATEMENT SHOWING THE COSTS OF SLASH DISPOSAL ON THE
TWIN LAKES TIMBER UNIT OF THE COLVILLE INDIAN RESERVATION
DURING THE YEAR 1944.

Item of Expense	Costs Incurred by the Lincoln Lumber Company.		Costs Incurred by the Indian Service		Total Costs
	Man Hrs. Etc.	Cost	Man Days, Etc.	Cost	
1. Fall burning of 16,400,000 ft. B. M. of slash.					
Salaries & Wages,			23	152.76	
Transportation,				39.30	
Materials,					
TOTAL				192.06	
Avg.Cost per M.Ft. B.M.				.002	
2. Cost of tractor piling 600,000 ft. B. M.					
Salaries & Wages					
Tractor Expense					
TOTAL					
Avg. cost per M.Ft.B.M.					
3. Total Cost of Disposal Operations				192.06	
Avg.cost per M. Ft. B.M.				.002	

TABLE NO. 5

STATEMENT SHOWING THE COSTS OF SLASH DISPOSAL ON THE
MANILA CREEK INDIAN LOGGING UNIT OF THE COLVILLE INDIAN RESERVATION
DURING THE YEAR 1944

Item of Expense	Costs Incurred by the various Operators.		Costs Incurred by the Indian Service		Total Costs
	Man Hrs. Etc.	Cost	Man Days, Etc.	Cost	
1. Spring burning of 3,900,000 Ft. B. M. of slash.					
Salaries & Wages,			53	216.89	
Transportation,				68.70	
Materials,				27.50	
TOTAL				307.09	
Avg.cost per M.Ft.burned				.079	
2. Fall burning of 1,800,000 ft. B. M. of slash.					
Salaries & Wages,			3	23.92	
Transportation,				4.97	
Materials,					
Tractor Expense,					
TOTAL				28.89	
Avg. Cost per M.Ft burned				.016	
3. Total cost of Burning 5,700,000 Ft. B. M.				335.98	
Avg. cost per M. ft. burned				.059	

PHOTO NO. 1

Tractor piled slash in SE/4 Section 17, Township 32 North, Range 29 East, N. M. on the Kartar Unit. The timber was cut by the Biles-Coleman Lumber Company in June, 1944, and the slash was piled one month later. This photo was taken in late August, 1944, and the slash was burned on the date of October 2.

PHOTO NO. 2

Tractor piled slash in SE/4 Section 12, Township 34 North, Range 35 East, near Elbow Lake, on the Twin Lakes Unit. This photo was taken in August, 1944, at the time that the slash was piled. This slash is still unburned. Standing by the pile are Edward Whalen, Forester, and Sgt. Edward Hall, formerly Scaler in charge of the Twin Lakes sale.

"Tuftear"

FILING FOLDERS

TO DUPLICATE THIS FOLDER ORDER

Globe-Wernicke

NO. 621½

MADE IN U. S. A.

PHOTO NO. 3

Burning crew refilling propane gas torch at noon hour on the date of September 30, 1944, in NE/4 Section 19, Township 32 North, Range 29 East, on the Karter Unit. Kneeling by the gas tank is Mathew ("Bughouse") Dick, Forest Guard. Next, with his back turned, is Morris Lodoen, Forest Guard, then Tom Andrews, Forest Guard, preparing to pick up his torch. Silas Davis, Forest Ranger and Fire Chief, is standing behind Mr. Andrews. Edward Whalen, Forester in charge of timber sales, is next to the right, and to the extreme right is Pete Whitelaw, Scaler.

PHOTO NO. 4

Morris Lodoen burning tractor piled slash in NW/4 Section 8, Township 32 North, Range 29 East, on the morning of September 29, 1944.

"Tuftear"

FILING FOLDERS

TO DUPLICATE THIS FOLDER ORDER

Globe-Wernicke

NO. 621½

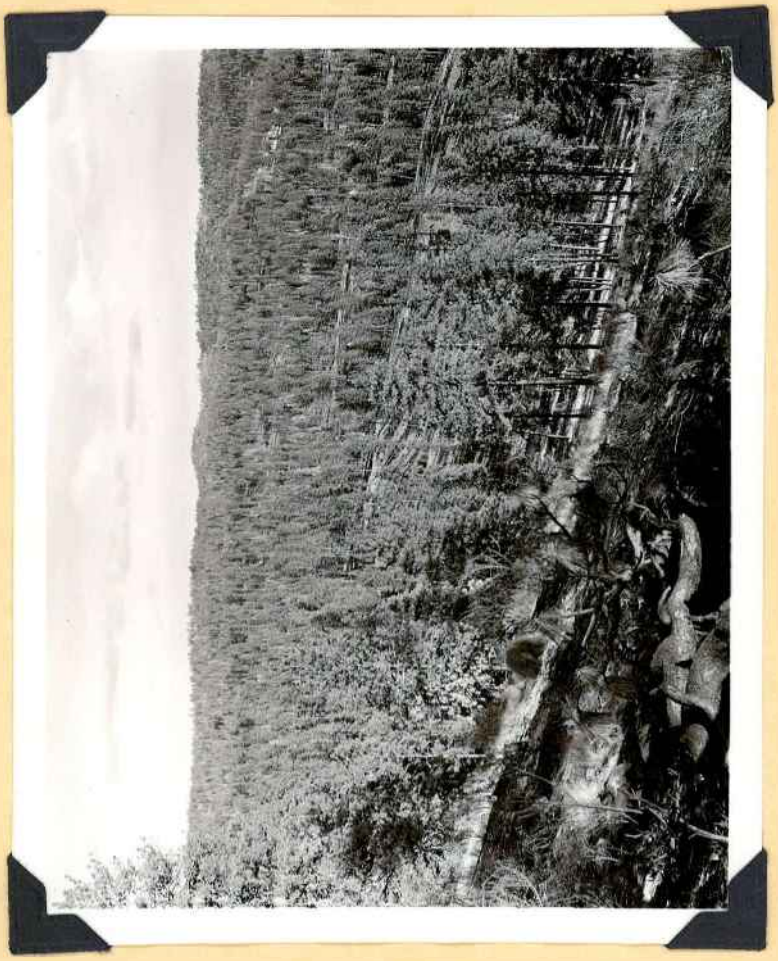
MADE IN U. S. A.

PHOTO NO. 5

This photo was taken in late October, 1944, shortly after the slash was broadcast burned on the Hall allotments on the North Fork of Hall Creek on the Twin Lakes Unit. Area pictured is in the SE/4 NW/4 Section 32, Township 34 North, Range 86 West. This stand was originally characterized by an overstory of large overmature pines, occurring as scattered individuals and groups, with an understory of thrifty, fast growing immature pines of Keen's age Class 1. One of the groups of large pines was cut where the photo was taken. The burning of the slash resulted in the partial scorching of the foliage of some of the surrounding young trees. This foliage appears lighter in the photo, in contrast to the darker green foliage. Such scorching is not serious and practically all of the young trees will survive, even the small ones in the foreground to the right. Photos taken from this spot in future years will doubtless prove interesting.

PHOTO NO. 6

View to the east and southeast across Sections 17 and 16, Township 22 North, Range 29 East, on the Kartar Unit, after tractor piled slash was burned in late September and early October, 1944. This photo was taken from a point in NE/4 SE/4 Section 18. The steeper slope in the immediate foreground, where the piling tractor could not work to advantage, was broadcast burned. Across the picture in the middle distance can be seen the darker strip of still uncut timber in the east half of Section 17. The light appearing trees in the middle distance and on the ridge in the background to the left are western larches, the foliage, which at the time that the photo was taken in early November, had all faded to yellow or gold in color, as is characteristic of this species. The area here pictured is characteristic of the Oniak Lake Ridge summit, where slash burning was conducted during the fall of 1944.



"Tuftear"

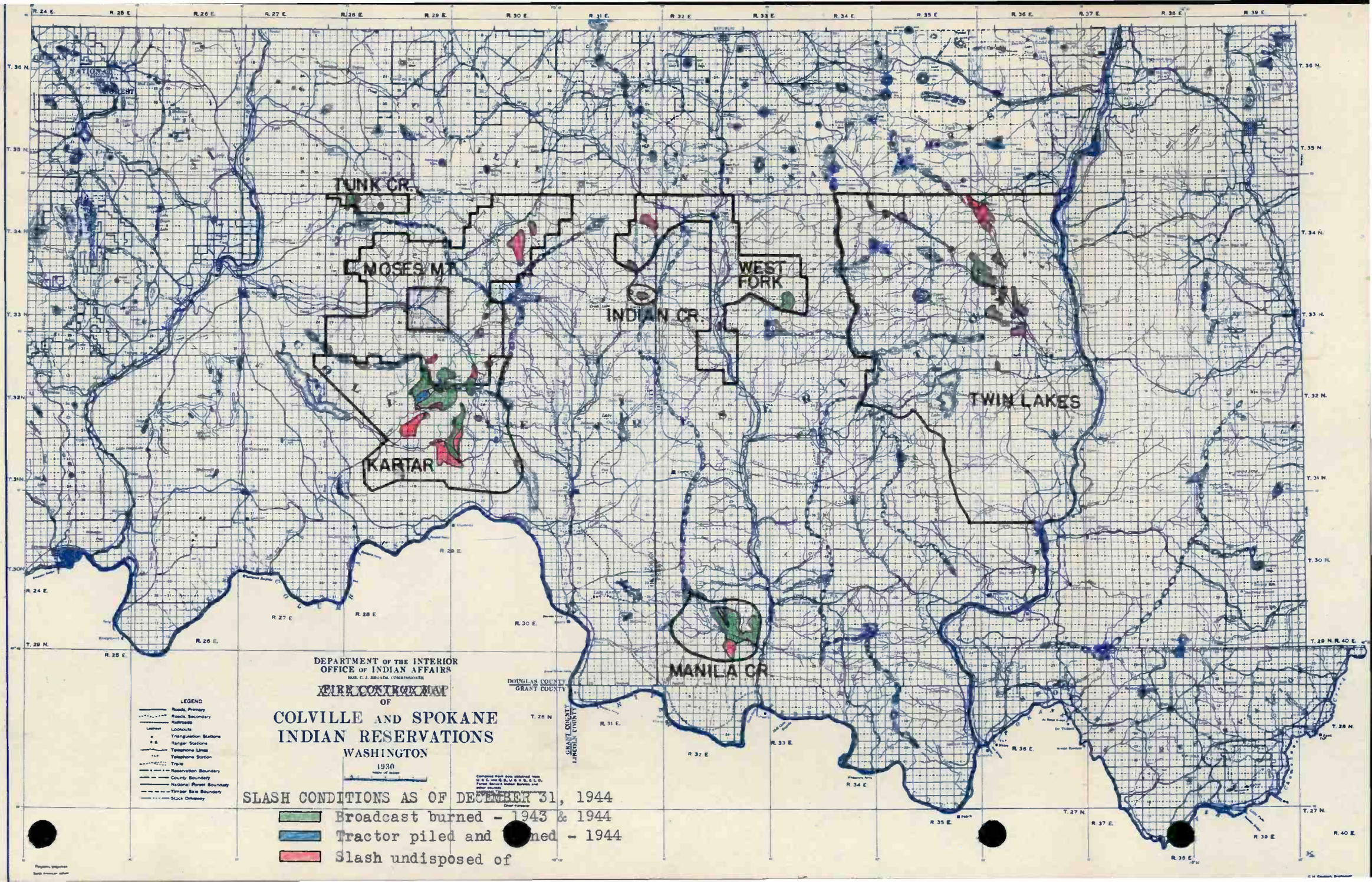
FILING FOLDERS

TO DUPLICATE THIS FOLDER ORDER

Globe-Wernicke

NO. 621½

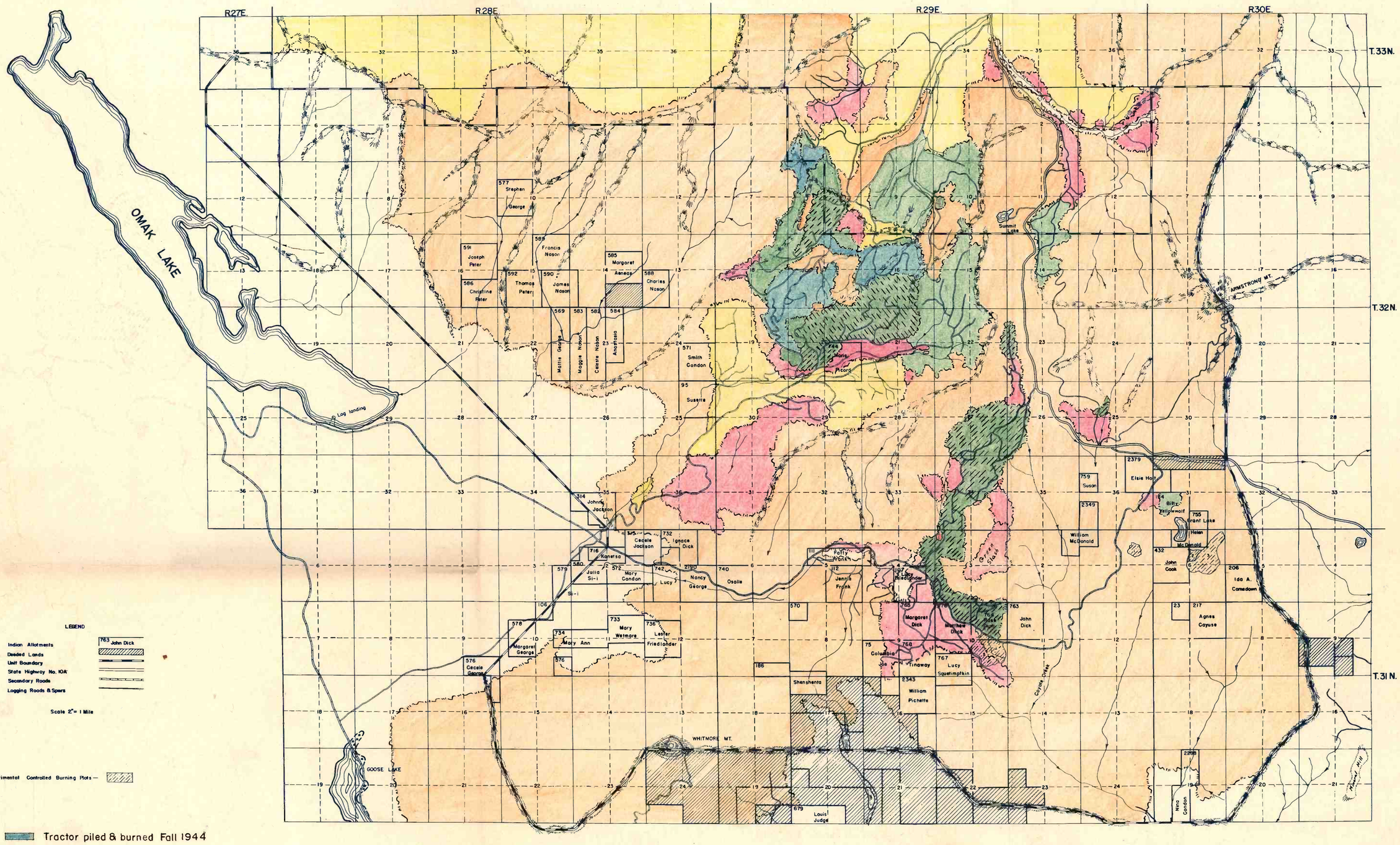
MADE IN U. S. A.


TUNK CR.
MOSES MT.
INDIAN CR.
WEST FORK
TWIN LAKES
KARTAR
MANILA CR.
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS
FIRE CONTROL MAP
OF
COLVILLE AND SPOKANE
INDIAN RESERVATIONS
WASHINGTON
1930
LEGEND
SLASH CONDITIONS AS OF DECEMBER 31, 1944
Broadcast burned - 1943 & 1944
Tractor piled and burned - 1944
Slash undisposed of

KARTAR LOGGING UNIT

COLVILLE INDIAN RESERVATION, WASHINGTON

LOGGING SLASH CONDITIONS ON AREAS CUT
PRIOR TO DECEMBER 1, 1944



E. J. Wholen — Feb. 1, 1944

TWIN LAKES LOGGING UNIT

COLVILLE INDIAN RESERVATION,-WASHINGTON

SLASH CONDITIONS ON AREAS CUT PRIOR TO 1945

R. 34 E. R. 35 E. R. 36 E.

T. 34 N.

T. 33 N.

HALL CREEK ROAD

DAILEY TRAIL

LONG LAKE

NORTH TWIN LAKE

ROUND LAKE

SUB-AGENCY

INCHELIUM

INCHELIUM FERRY

DAM

R. 37 E.

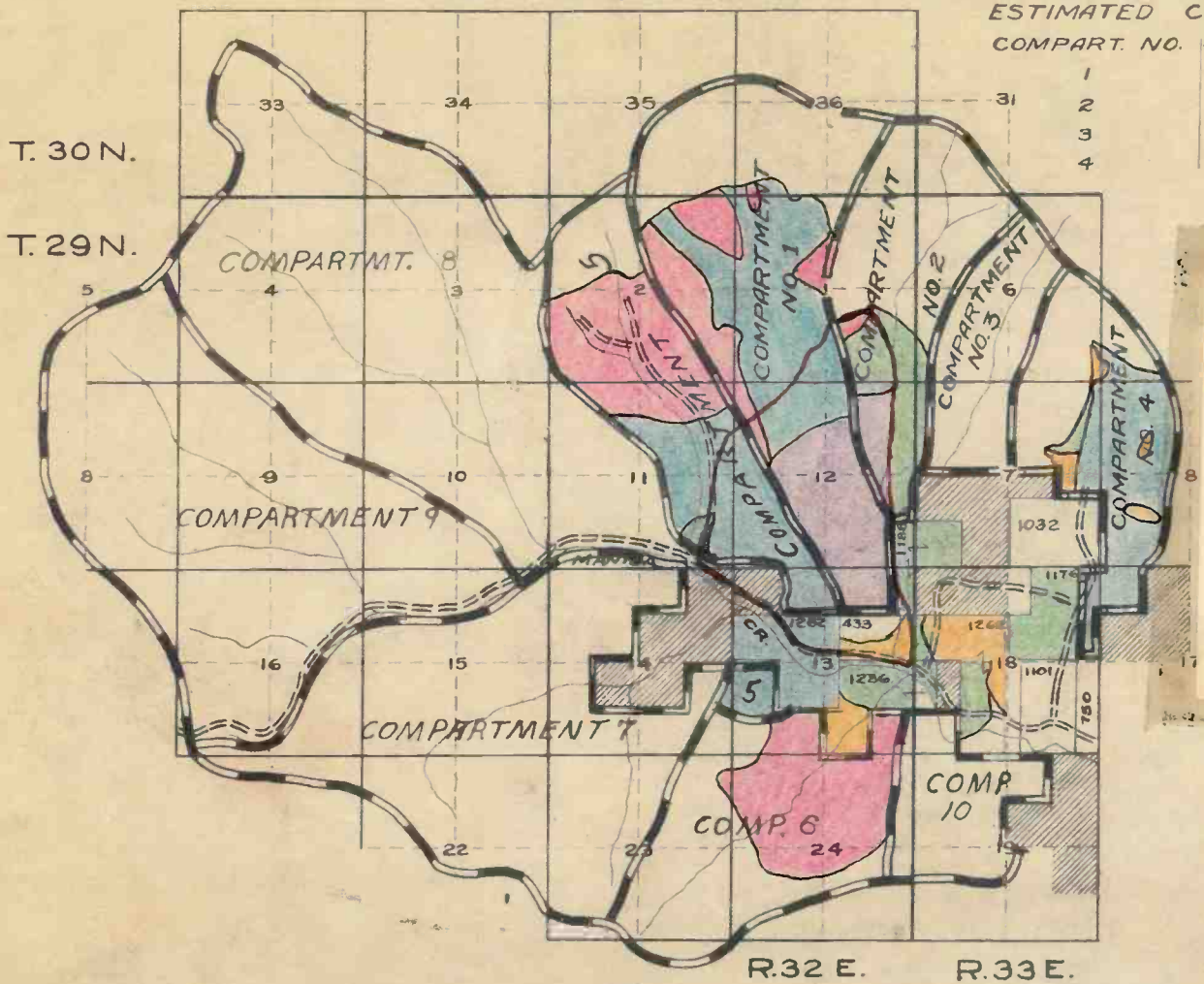
RESERVOIR

LEGEND:

- Broadcast burned Fall 1944
- Tractor piled & burned Fall 1944
- Unpiled & unburned
- Cut by Hedlund Lr. Co. 1928-29

MANILA CREEK LOGGING UNIT

SLASH CONDITIONS ON AREAS CUT PRIOR TO JANUARY 1, 1945



ESTIMATED COMPARTMENT VOLUMES

COMPART. NO.	GROSS VOLUME	VOL. TO BE CUT
1	5,000,000'	2,500,000'
2	3,097,000'	1,500,000'
3	1,361,000'	700,000'
4	1,569,000'	900,000'

VOLUME-MBd Ft.

Sec	P.P.	D.F.	W.L.	Misc.	Total
1	3,023	85			3,108
2	1,910	280	2		2,192
3	1,655	297			1,952
34	754	201	66		1021
Tot.	42,400	5,018	456		47,874

LEGEND

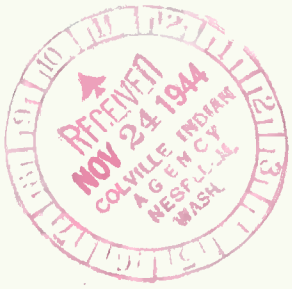
	Acres
Piled & Burned	439
Broadcast Burned	1421
Piled & Broadcast Burned-1942	371
Unpiled & Unburned	736
Piled & Unburned	179
1942 Fireline	
Total Cut	3146

	Acres
Tribal Land	12.200
Trust Pat.	960
Fee Pat.	760
Total	13.920

Legend

Allotments 1724
Alienated Land
Compart. Boundary

MH. 9-9-41


RECEIVED
NOV 24 1944
COLVILLE INDIAN
AGENCY
NESPELEM,
WASH.